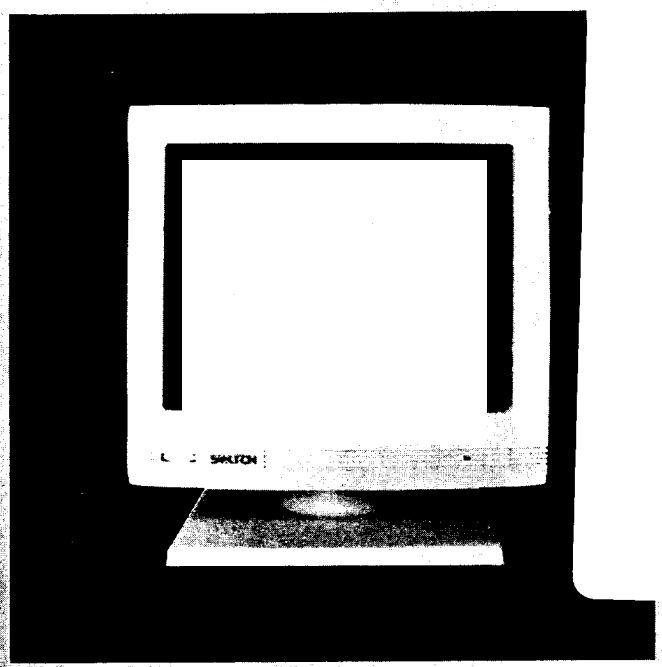
SAMSUNG ELECTRON DEVICES

VGA MONOCHROME MONITOR

SERVICE MANUAL

SM-440



SPECIFICATIONS

· Power source	AC 115V±15 % / 60Hz, 230V±15 % / 50Hz
· Power consumption	50Watts Max.
· Input connector	15 Pin D-sub connector
· Video signal input	Analog 0.7p-p
· Horizontal sync	TTL level positive, Negative
· Vertical sync	TTL level negatie, Negative
· Picture tube	14" diagonal, 90° deflection
	14HBY××N Phosphor P 39, PLA. PWD. Available
· Scanning frequency	Horizontal – 31. 47 KHz
	Vertical – 60 / 70Hz
· Active video period	Horizontal – 26. 48 μS
	Vertical – 16. 07ms
· Resolution	Horizontal – 720 dots
	Vertical – 480 lines
· Active display area	235 (H) × 175 (V) mm
· Display charactor	80 characters with 30 line (7×9 dots)
· Dimensions	318 (W) × 343 (H) × 315 (D) mm
· Weight	11kg Approx.

※ **NOTE** : Specification are subject to change without notice

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SPECIFICATIONS

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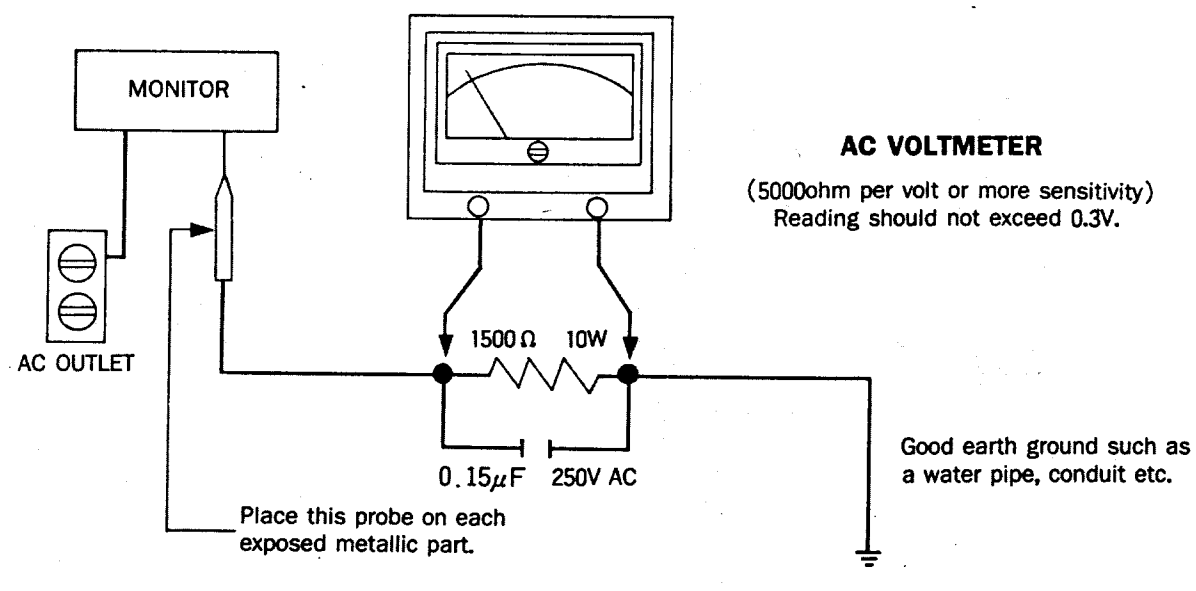
1. GENERAL INFORMATION

(1) SAFETY PRECAUTION

WARNING: Service should not be attempted anyone unfamiliar with the necessary precautions on this unit. The following precautions are necessary during servicing.

1. Some parts such as a picture tube in this unit have special safety-related charaeristics for X-RAY RADIATION protection.
   For continued safety, the parts replacement should be undertaken referring to item 2 below.
2. Many electical mechanical parts in this unit have special safety-related characteristics for protection against shock hazard and others.
   These characteristics are often passed unnoticed by a visual inspection and the protection afforded by them cannot necessarily be obtained by using replacement components rated for higher voltage wattage, etc.
   Replacement parts which have these special characteristics are identified in the manual and supplements by shading on the schematic diagram and the parts list.
   Before replacing of these components read the parts list in this manual, carefully.
3. When replacing chassis in the cabinet, always be certain that all the protective devices are installed properly, such as insulating covers, strain relief, etc.
4. Before replacing the back cover of the set, thoroughly inspect inside the cabinet to see that no stray parts or tools have been left inside.
5. Before returning the set to the customer always perform an Ac leakage current check on the exposed metallic parts of the cabinet, such as terminal, screwheads, metal overlays, control shafts, etc. To be sure the set is safe to operate without danger of electrical shock. Plug the AC line cord directly into a 115V AC outlet (do not use a line isolation transformer during this check). Use an AC voltmeter having 5000 ohms per volt or more sensitivity in the following manner.
   Connect a 1500 ohm, 10 watt resistor, paralleled by a 0.15mfd(μF), 250V AC capacitor, between a known good earth ground (water pipe, conduit, etc.) and the exposed metallic parts, one at a time.
   Measure the Ac voltage across the combination of 1500 ohm resistor and 0.15 mfd(μF) capacitor. Reverse the AC plug at the AC outlet and repeat AC voltage measurements for each exposed metailic part. Voltage measured must not exceed 0.3V RMS. This corresponds to 0.2mA AC any value exceeding this limit constitutes a potential shock hazard and must be corrected immediately.


MONITOR
AC VOLTMETER
(5000ohm per volt or more sensitivity)
Reading should not exceed 0.3V.
AC OUTLET
1500Ω 10W
0.15μF 250V AC
Good earth ground such as a water pipe, conduit etc.
Place this probe on each exposed metallic part.

Voltmeter Hook-up for Leakage Current Check

GENERAL INFORMATION

- **MONITOR DESCRIPTION**
  This 14" Flat screen CRT display monitor is operated in TTL drive mode, Analog video mode input

- **OPERATING CONTROLS**
  1) External controls
  • Front
  Power switch, LED lamp, contrast.
  • Rear
  15Pin D-sub connector, inlet socket for AC power input, H-shift, Brightness

  2) Service controls(internal controls)
  V-linearity, H-width,V-size1,2,3, focus, sub-brightness, horiz. & vert. Centring magnet, H-Hold

- **DISPLAY MONITOR ELECTRICAL CHARACTER**
  1) AC Power Input : AC115V/230V
  Power consumption is 35W under normal viewing condition and uses internal fuse protection.
  2) video
  -Input : 0.7Vp-p, Analog
  -Band Width : 30MHZ(-3dB)
  3) Horizontal Electrics
  -Hold Range : 30.5KHZ-32.5KHZ
  AUTO-Adjustment Range
  -Retrace Time : 5.3μs (Includes retrace and delay time)
  4) Vertical Electrics
  -Hold Range : 45HZ to 90HZ
  -Retrace Time : 600ms min(includes retrace and delay time)
  5) Adjustment size range : 235(H)×175(V)mm
  (Horizontal, vertical from 5% over scan to 5% under scan)

- **MECHANICAL SPECIFICATION**
  Figure-1 shows the mechanical specification for the flat screen CRT display monitor,

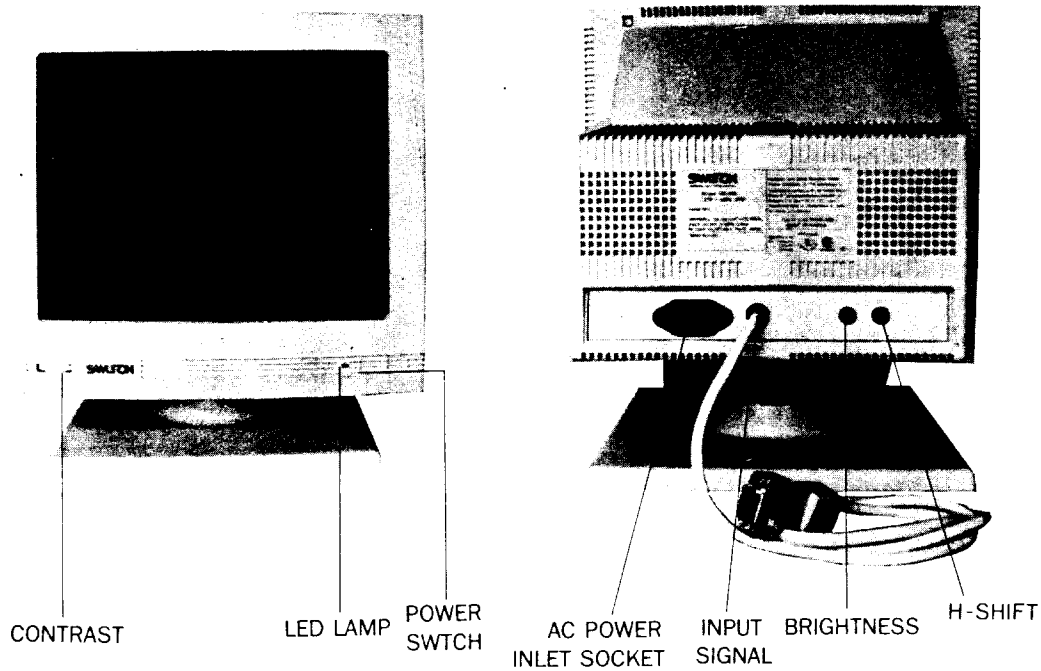
- **CRT DISPLAY CHARACTERISTICS**
  1) Cathode Ray Tube Specification
  -Size : 14" diagonal
  -Deflection Angle : 90°
  -Implosion Protection : Shirinkage band with mounting lug.
  -Phosphor : P 39, PLA. PWD.
  -Display size : 253(H)×195(V)(mm)
  -Face : Direct Etched
  -Anode Voltage : 13.0±1KV
  2) Picture Quality
  -Resolution : 1100TV line at center, 900TV line at corner at 5 foot lambert with full "E" character.
  -Geometric Distortion : The perimeter of display pattern approaches and ideal rectangle to within±1.5% of the rectangle height.
  -Linearity : Character height or width shall be within 10% of that of and adjacent character and within 20% of that for any character on the screen.
  -Display Capability : 80 Characters×30 Rows

- **ENVIRONMENTAL SPECIFICATION**
  The monitor is capable of meeting all performance requirement and operate continously and reliably during and after exposure to any or all of the following environments,
  1) Temperature
  -Operating : 5℃ to+40℃
  -Storage : −35℃+50℃
  2) Humidity : 5 to 90 percent (non condensing)
  3) Altitude
  -Operating : Up to 10,000 FT
  -Non Operating : Up to 50,000 FT

- **X-RADIATION**
  The monitor shall meet the applicable requirement of D.H.H.S regulations (21CER. SUBCHAPTER J) for X-radiation emission.

- **WEIGHT** : Approx 11kg

CONTROLS AND TERMINAL IDENTIFICATION



IMPORTANT NOTICE FOR SERVICES PERSONNEL BEFORE SERVICING

PLEASE READ BEFOREATTEMPTING SERVICE

1. Line voltage must be kept with in 115V/230V range
2. Do not discharge, arc, or measure high voltage when high voltage lead is connected to CRT. Discharge 2nd anode of CRT only after high voltage lead has seen disconnected. Do not discharge high voltage lead at any time, damage to transistors may result.
3. While the monitor is in operation, do not attempt to conncet or disconnect any wires.
4. Disconnect all power before attempting any repairs.
5. When the power is on, do not arrempt to short any portion of the circuit. This shorting may cause damage to the transistors in the monitor.

ADJUSTMENT

Apply power, TTL sync and Analog vido input signal (alphanumeric information) to the data display

CENTERING

1. Loosen the deflection yoke clamp and carefully move the yoke on the neck of the picture tube as far forward as possible.

Rotate the yoke until the top bottom edges of the raster are straight. Tighten the clamp.

2. Center the rester by rotating the centering magnets.

FOCUS

Adjust focus control VR 305 for providing the best focus.

HORIZONTAL WIDTH

1. Horizontal width coil to obtain the optimum width for full information. if the recommended input signal format in used, the should be 235mm.
2. when character width variation is observed in character of one row, turn the core of the horizontal linearty control until the character width is uniform.

VERTICAL SIZE AND LINEARITY

1. Automatically synchronize the vertical frequency to the imformation signal.
2. Adjust vertical linearity control VR 203 for the vest linearity VR501 for mode 2 (400lines) VR502 for Mode 3 (350lines) and size control VR 202 for mode 1 (480lines), to obtain the optimum height. if the recommended input signal format used, the height should be 175mm.

SERVICE INFORMATION
ADJUSTMENTS

• BRIGHTNESS

Normally, the monitor will be used to display alphanumeric or other black and white information moreover, the video polarity is ussally white characters on a black background.

The brightness control VR304 should be adjusted at a point where the whiles raster is just extinguished.

The CRT with then be at its cutoff point, and a maximum contrast ratio can be obtained when a video signal is applied fully.

• VERTICAL ADJUSTMENTS

There is slighty interaction among the vertical frequency height and linearty controls. A change in the height of the picture may affect linearity.

1) Automatically set the vertical-hold when apply the vertical signal to obtain to optimum height.
2) Adjust the vertical linearity control VR 203 for best vertical linearity.
3) Adjust the vertical height control VR202, 501, 502 for desired height.
4) Recheck height and linearity, and readjust, if necessary.

• HORIZONTAL ADJUSTMENTS

Raster width is affected by a combination fo the DC power supply, horizontal width coil.

1) Horizonital frequency Hold
   Measure the voltage wave frequency of IC 301 pin #14 by oscilloscope or frequency counter. and adjust the Horzontal hold control VR 301 until the voltage frequency 31.5 KHz at no signal
2) Horizontal Width
   Adjust horizontal width by turning the core of with a plastic hexdrive for the desired width.

• DEFLECTION YOKE ASSEMBLY ADDUSTMENTS

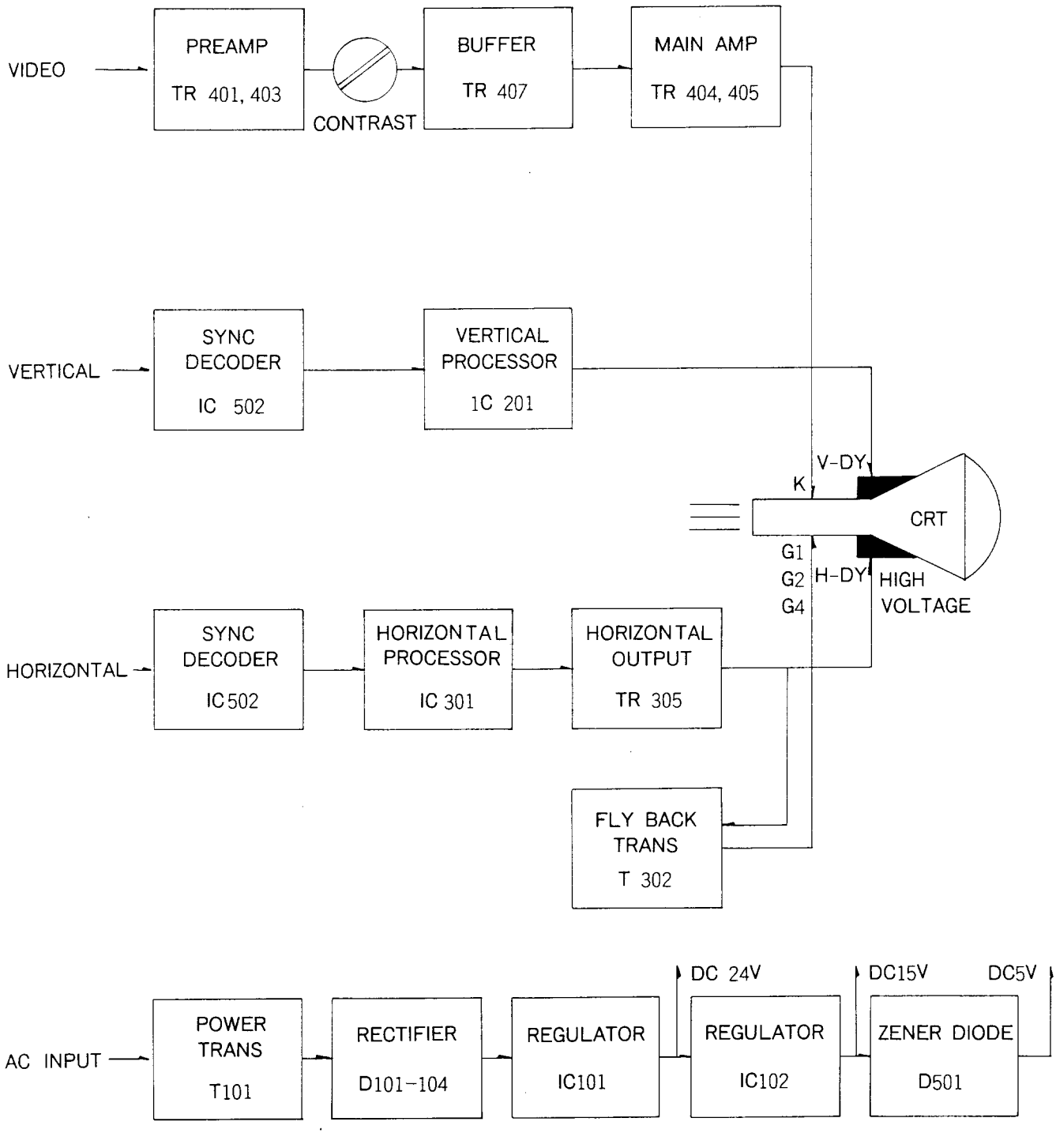
1) RASTER CENTERING
   If the raster is not properly centered, it may be repositioned by rotating the ring magnets behind the deflection yoke.
   The ring magnets should not be used to offset the raster from its nominal center position because it would degrade the resolution of the display if the picture is tilted rotate the entire yoke.
2) GEOMETRIC CORRECTIONS
   The magnets on the yoke assembly shall be polarized so as to provide adjustment of pin-cushion, barreling and other geometric deformitics by simply rotating the magnets until the desired display is achieved re-adjust if necessary.

• FOCUS ADJUSTMENTS

Although the focus control, VR 305 dose not have large effect on focus because of the CRT gun-assembly construction.

So there is a dynamic focus which does not control. If provides some adjustment for maintaining the best overall display focus.

BLOCK DIAGRAM



THEORY OF OPERATION(CIRCUIT DESCTIPTION)

1. VIDEO AMP

This circuit is ANALOG amplifier, consist of pre. amplifier and main amplifier.
Video signal applied R401, C401 is filterable capacitor.
Q401 and Q403 drived signal and connected contrast volume(VR401).
Level of video signal via contrast volume shift to Q407.
Q404 and Q405 are connected cascode amplifier. Finally signal is applied to CRT cathode through cascode amplifier.

2. VERTICAL PROCESS CIRCUT

Vertical deflection circuit consiost of two stage, IC201, IC502 whcih accomplishes all active vertical syne. functions.
Vertical sync input applied pin #1, 13 of pin of IC502, voltage of pin #3.12 of IC 502 changed logic(0), (1).
Only positive waveform generated at pin #11 of 502.
This waveform synchronoze vertical synchroni zation that applied pin #9 IC 201
The osillator henerates non-symmetical square wave wiht a short duty cycle at approximately 45Hz. components R 507 and c504, determine the frequency.
This square wave signal is applied to a ramp generator whose slope and amplitude is determined by VR 202, 203 and R501, VR 502, R202, R207.
The ramp voltage signal is applied to a buffer stages witch isolates the ramp generator form the cutput stages and reduces any loding on the previous stages.
Component R212, 209, VR203, 204, 205 C203 reshape the ramp voltage signal to make it exitremely linear.
The output signal from the buffer stage is applied to a per-amp stage, for amplifacation and then to a power ramp stage which deived the vertical deflection solus display via coupling capacitor C209, C210, R211, R210, R216, R215, R212 and AC and DC feedback for the output stages to maintain proper gain and linearity.

3. HORIZONTAL PROCESS CIRCULT

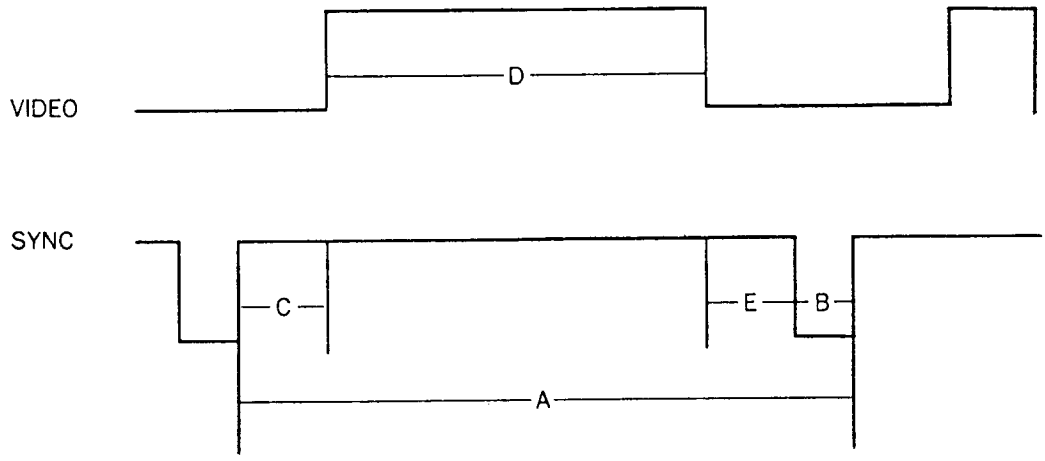
Horizontal deflection circuit consist of two stage.
Horizontal sync input applied pin #4, 10 of IC502. Voltage of pin #6, 9 of IC502 changed logic(0)、(1). only positive waveform generated at pin #8 of IC502.
This woveform synchronize horizontal synchroniozstion that applied pin #8, IC301 after differentiated by C304 and R309.
The free running frequency of the oscillator is determined by VR302, R314, R315, R316, C308, C303, and C307 connected to pin 14 and 15 of IC301 respectively.
To generate the line frequency output pulses, two thresholds are fixed along the fall ramp of the triangular waveform of the oscillator.
The oscillator is synchronised by comparing the phase of the sync pulses in the oscillator after it has been filtered properly with an external low-pass circuit.
The outputs of IC301 are suitable for driving transistor output stages, they deliver positive pulse at pin 3 of IC301
The rise and fall times of the output pulses are about 150 nS
So that interference due to radiation are avoided.
The outputs of IC301 is applied to base of TR301 via R317
The horizontal output transistor Q302 is turned on and off at the horizontal scan rate by the driving signal applied to its base.
A sawtooth current through the derlection coil is required to sweep the beam lineary across the CRT screen.
This happens when TR302 is truned on and its collector voltage dropes to near zero.
And then, C313 becoms discharging the derlection yoke coil which deflect the beam to the right edge of the CRT.
At that time, TR302 cuts off and C313 causes to supply current to the deflection coil.
Howver, an induced voltage appear across the

deflection yoke coil as the magnetic
Field collapses and an oscillation then occurs the deflection coils and C313
During the first half cycle of this oscillation the induced voltage is felt across
The collector of now cut TR302, C313 and the primary of T301. (FBT)
This voltage is stepped up by T301 and rectified to produce high voltage that is applied to the 2nd anode at the CRT.
During the second half cycly of the deflection coil C313 oscillection, the voltage on the collector still cut off TR302 becomes negative.
At this time damper diode D303 becomes forward dias and begins conduction,

The DC operating voltage for the CRT with the exception of the hearter voltage are all obtained by rectifing and filtering of the horizontal flyback pulse.
D306 and C321 rectify and filter the flyback pulse across TR302 to produce a G2 voltage.
This voltage also feeds to the flyback pulues that rectified and fitered by D308 and C318 to producd voltage which is used as the source voltage for G1 control raster brightness.
Also, the CRT anode voltage is developed by T301
This voltage is typically 13.00KV for 14″ normal size.

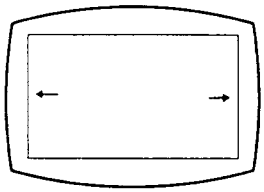
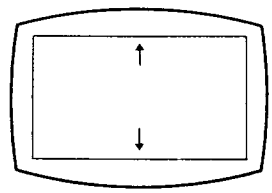
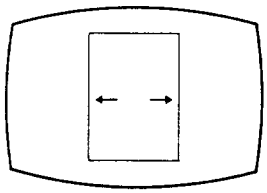
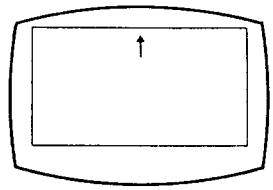
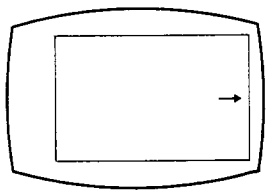
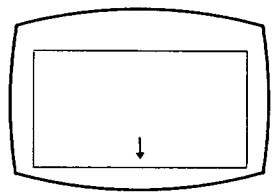
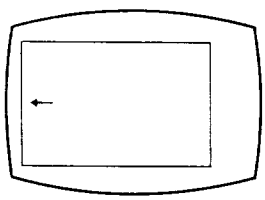
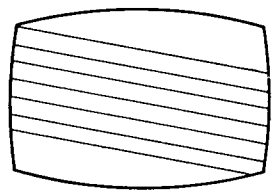
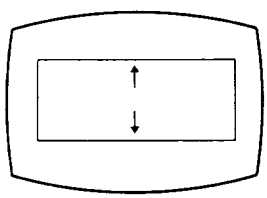
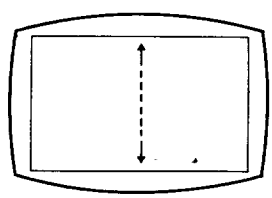
FIGURES

1. SIGNAL TIMING CHART

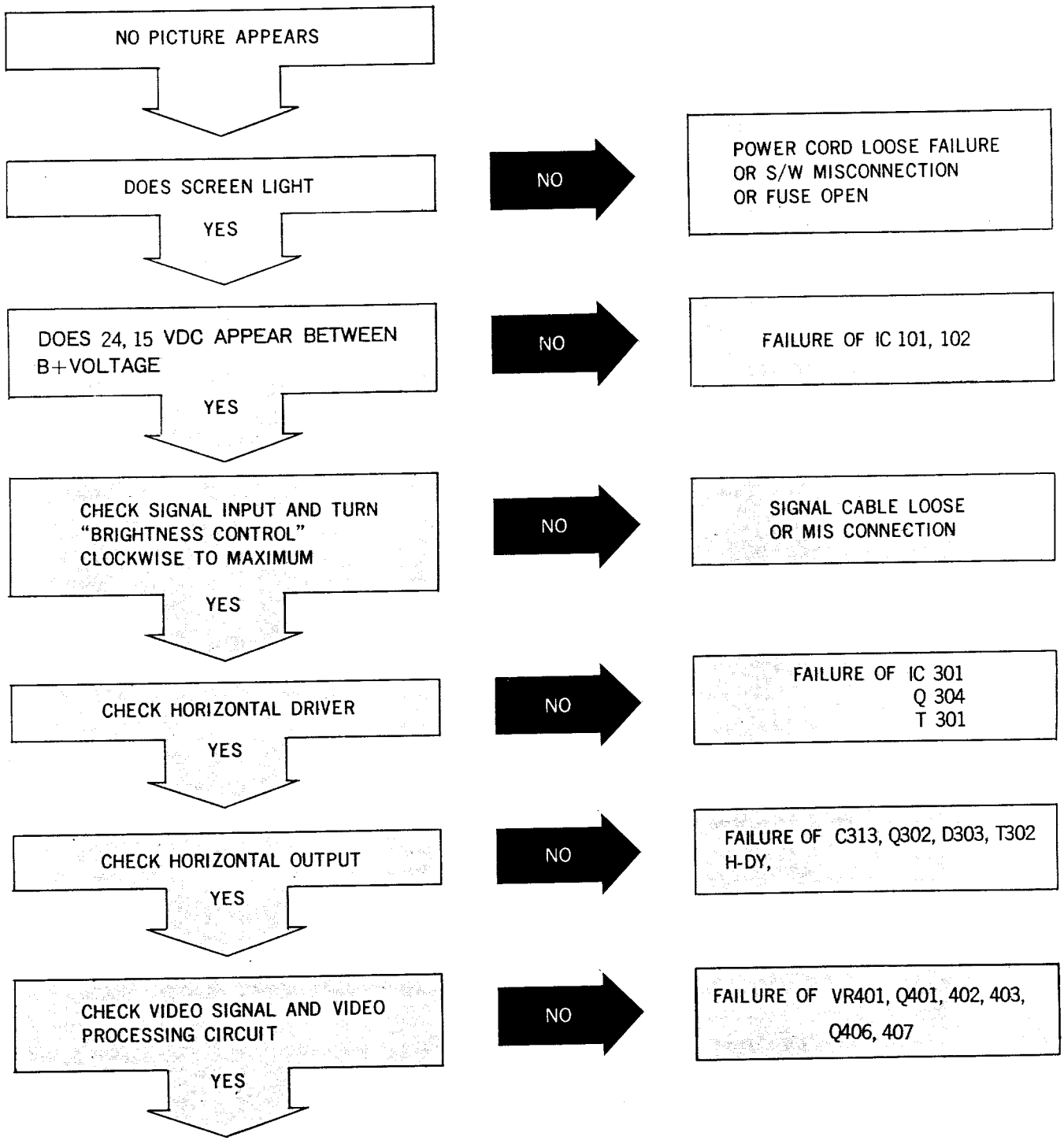


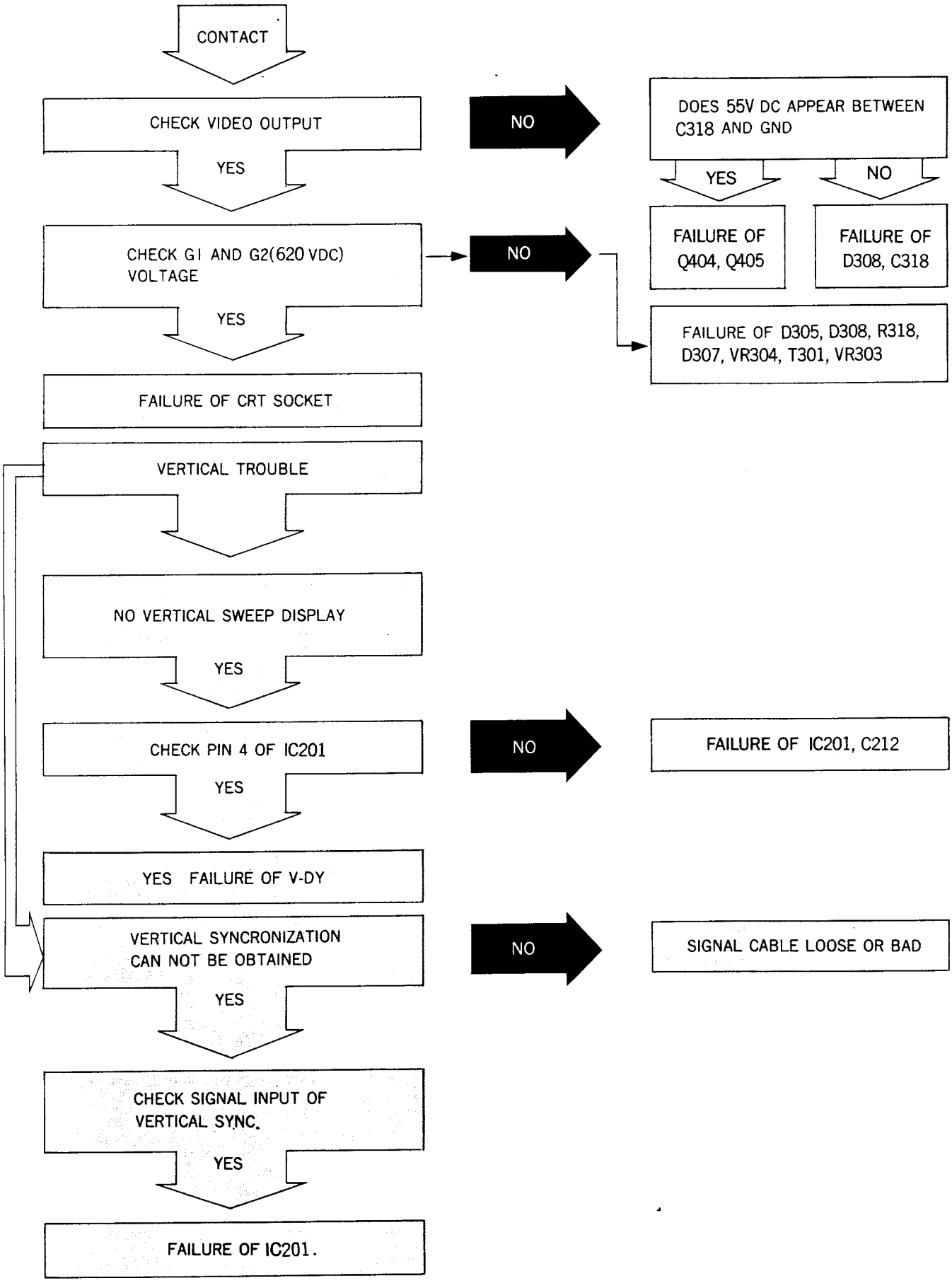
		MODE-1(480 LINES)	MODE-2(400 LINES)	MODE-3(350 LINES)
H	A	31.8uSEC	31.8uSEC	31.8uSEC
	B	3.8uSEC	3.8uSEC	3.8uSEC
	C	1.9uSEC	1.9uSEC	1.9uSEC
	D	25.4uSEC	25.4uSEC	25.4uSEC
	E	0.7uSEC	0.7uSEC	0.7uSEC
	SYNC.P	NEGATIVE	NEGATIVE	POSITIVE
V	A	16.683mSEC	14.268mSEC	14.268mSEC
	B	0.064mSEC	0.064mSEC	0,064mSEC
	C	0.793mSEC	0.890mSEC	1.716mSEC
	D	15.762mSEC	13.155mSEC	11.52 lmSEC
	E	0.064mSEC	0.159mSEC	0.985mSEC
	SYNC.P	NEGATIVE	POSITIVE	NEGATIVE
VIDEO		ANALOG	ANALOG	ANALOG

WHEN SIGNALS OTHERS THEN THE RECOMMENDED SIGNAL ARE RECEIVED

PHENOMENON	CAUSE	PHENOMENON	CAUSE
Picture width too wide. 	Data display period is more than 25.4μs	Height of picture too much extended. 	Vertical flyback period is less than 600μs
Picture width too narrow. 	Data display period is less than 25.4μs	Picture deviates up ward. 	Picture until that vertical sync signal period or more.
Picture deviates to the right 	Value of front porch is more than 1.9μs or value of back porch is less than 1.9μs	Picture deviates down ward. 	Picture until that vetical sync signal period or less.
Picture deviates to the left. 	Value of front porch is less than 0.7μs or value of back porch is more than 0.7μs	Picture becomes lateral stripes. 	Horizontal sync. frequency is not set to 31.47KHz
Height of picture too shortened. 	Vertical flyback period is more than 600μs	Picture flows vertically (upward and down ward) 	Vertical sync. frequency is not set to 60 or 70Hz 60Hz:480lines 70Hz:400lines 350lines

TROUBLE SHOOTING INFORMATION CHART




CONTACT
CHECK VIDEO OUTPUT
NO
DOES 55V DC APPEAR BETWEEN C318 AND GND
YES
NO
YES
CHECK G1 AND G2(620 VDC) VOLTAGE
NO
FAILURE OF Q404, Q405
FAILURE OF D308, C318
FAILURE OF D305, D308, R318, D307, VR304, T301, VR303
FAILURE OF CRT SOCKET
VERTICAL TROUBLE
NO VERTICAL SWEEP DISPLAY
YES
CHECK PIN 4 OF IC201
NO
FAILURE OF IC201, C212
YES
YES FAILURE OF V-DY
VERTICAL SYNCRONIZATION CAN NOT BE OBTAINED
NO
SIGNAL CABLE LOOSE OR BAD
YES
CHECK SIGNAL INPUT OF VERTICAL SYNC.
YES
FAILURE OF IC201.

TROUBLE SHOOTING FOR RESPECTIVE SYMPTOMS

- **NO POWER**

  Check the B+Voltage of power part

  1) If B+voltage not obtained ;
     Check open or short of F101, D101, D102, D103, D104, IC101, IC102
  2) If B+voltage obtained ;
     Proceed to next check Item.

- **NO RASTER**

  1) Turn the internal brightness control colckwise fully if raster appears:Good
     If raster does not appear:No good to next check item.
  2) Is CTR heater on ?
     it is not on :Check CTR-heater voltage, power supply circuit and CRT scoket for normality.
     It is on:proceed to next check item.
  3) Check high-voltage voltmeter.
     High voltage is not obtoined:
     Check of flyback transformer T302 chcek the collector pulse of TR305, base pulse of TR 305 High voltage is obtained : to next check item.
  4) Check respective CRT electrode voltage for normality wiht a multi-tester.
     -G1 : -100-10V
     -G2 : 550-650V
     -G4 : 0V -400V
     -K : 50V-60V
     -When voltage of G2 and G4 are not obtainde: Check of D306, D701, D307, D308, T302, wire breakdown.
     -Voltage of G1 is not obtained: Check of D307, D308, R319, R327, VR304, VR303
     -Voltage of K is not obtained:
     Check of D307, D308, C318, C319, R319 wire breakdown.
     -Voltage of G2, G4 and K are normal:
     CRT is faulty, rplace CRT

- Only one raster line appears in horizontal direction:Check of deflection yoke vertical coil is shorted or opened. Deflection yoke is faulty and should be replaced.

- Only one raster line appears in vertical direction:Check for wire broken in deflection yoke horizontal coil, H-DY, width lin open, TR305 is short or open.

- Raster is deformed abnormally:Rare shorting of deflection yoke coil, replace deflection yoke.

- When power is truned off spot remains:Check C409, C318 and CRT for deterioration.

- Brightness range is abnormal:
  Deterioration of C320, or CRT, check of G2 voltage, check of heater voltage.Check of TR404, TR405 and SG1 and C318
- Rester size is small and picture is abnormally bright (high voltage is abnormally high) check of C313 or T302.
- Vertical sync, Is not achieced :
  Check of IC301, IC502.
- Raster position is deviated relative to CRT face: Turn deflection yoke centering magnent so that raster should be postioned at center.
- Picture or character do not appear, contrast is unachievable:
  -Check of Q401, Q403 and associated components.
  -Check of input signal.
  -Check of CRT.
  -Check of VR401, and D401

- Picture characters are displayed but inclined:
  -Loosen clamp screw on deflection yoke. Pectify the inclination by turning the entire deflection yoke.

- Fine lines(noise)apper in the picture and characters shiver:
  -Check high-voltage portion for leakage.
  -Check connectors for complete contact.
  -Check FBT for wire breakdown.

- It takes long for picture to appear(more than 15 seconds) service life of CRT has reasched replace CRT.
- Sync noise not replated with input data appears in picture:
  -Check grounding wire for poor contact video grounding for incompleteness input signal for mormality and power supply return for incompleteness.

- Pictrue appear and disappear alternately:
  -Check of input signal.
  -Check of video circuit for poor soldering.

-Check of CRT socket.

- Horiaontal linearity is not achieved:
  -Check of C314, TR305 Linearity Coil and deflection yoke horizantal coil(L302)

- Not holding of horzantal sync.
  Checkc the sync. signal of IC502 pin #8, IC301 pin #3
  1) If sync.signal not obtained :Fail of signal cable.
  2) If sync. signal obtained ; Check the VR302, C306, IC501
- Vertical linearity is not achieved:
  -Check of IC201, VR203, C204, C205

- Not holding of vertival syne.
  Check the sync. signal of IC201 Pin #9
  1) If sync. signal not obtained ; Fail of signal cable or C503
  2) If sync. signal obtained ; Check IC201, C504.R507

- Focusing is not achievable:
  -Check of voltage G2 and G4. Readjustment of VR 305
  -Check of high voltage.
  -Check of D307, D308
  When all above items are normal, CRT is faulty and should be replaced.

VOLTAGE CHART

1. TRANSISTOR

Measured with high impedance V.T.V.M or circuit tester under line voltage 120V (230V) reading may very ±10%

CKT NO.	Type	Function	Operating Condition	Base	Emitter	Collector	Measure Ment
Q304	2SC1815	Horizontal Drive	Non signal Signal input	0.31 0.31	0 0	17.6 17.7	Digital Volt meter
Q305	BU406	Horizontal Output	〃	-0.08 -0.08	0 0	30.63 30.60	〃
Q401	2SC1815	Video Drive	〃	1.96 1.94	1.3 1.29	13.48 13.47	〃
Q402	2N3904	Video Drive	〃	1.46 1.44	0.8 1.43	15.33 15.33	〃
Q403	A1015	Video Drive	〃	13.47 13.47	14.15 14.14	6.8 6.85	〃
Q404	C3502E	Video	〃	8.33 8.33	7.74 7.76	55.8 50.2	〃
Q405	C2408	Video Output	〃	0.8 1.42	0.13 0.76	7.74 7.76	〃
Q406	2N3904	Video Drive	〃	0.14 0.12	0 0	0.8 1.43	〃
Q407	2N3904	Video Drive	〃	4.36 4.35	3.7 3.7	15.33 15.33	〃
Q701	C1507	Amplifier	〃	1.12 1.10	1.25 1.24	89.5 89.4	〃
Q801	C1815	Swithching	〃	-2.22 -1.96	0 0	30.3 33.1	〃
Q802	C1815	Swithching	〃	-1.16 -1.16	0 0	30.3 33.1	〃

* MEASUREMENT OF TEXT MODE (720×400)

(Unit:V)

2. IC

PIN NO.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

IC 201 (KS 74 HCTLS 86)

Non Signal	0	0	0	0	0	0	0	0	0	0	0	0	0	5.3		
Signal Input	0.09	0	0	2.87	0	4.6	0	0.62	4.6	2.87	0.02	0	0.09	5.28		

IC 301 (TDA 1170N)

Non Signal	5.28	15.33	0.53	6.83	15.03	6.60	6.69	NC	3.07	2.10	0.69	4.43				
Signal liput	3.45	15.33	0.50	8.37	15.09	6.60	6.69	NC	2.63	2.08	0.67	2.60				

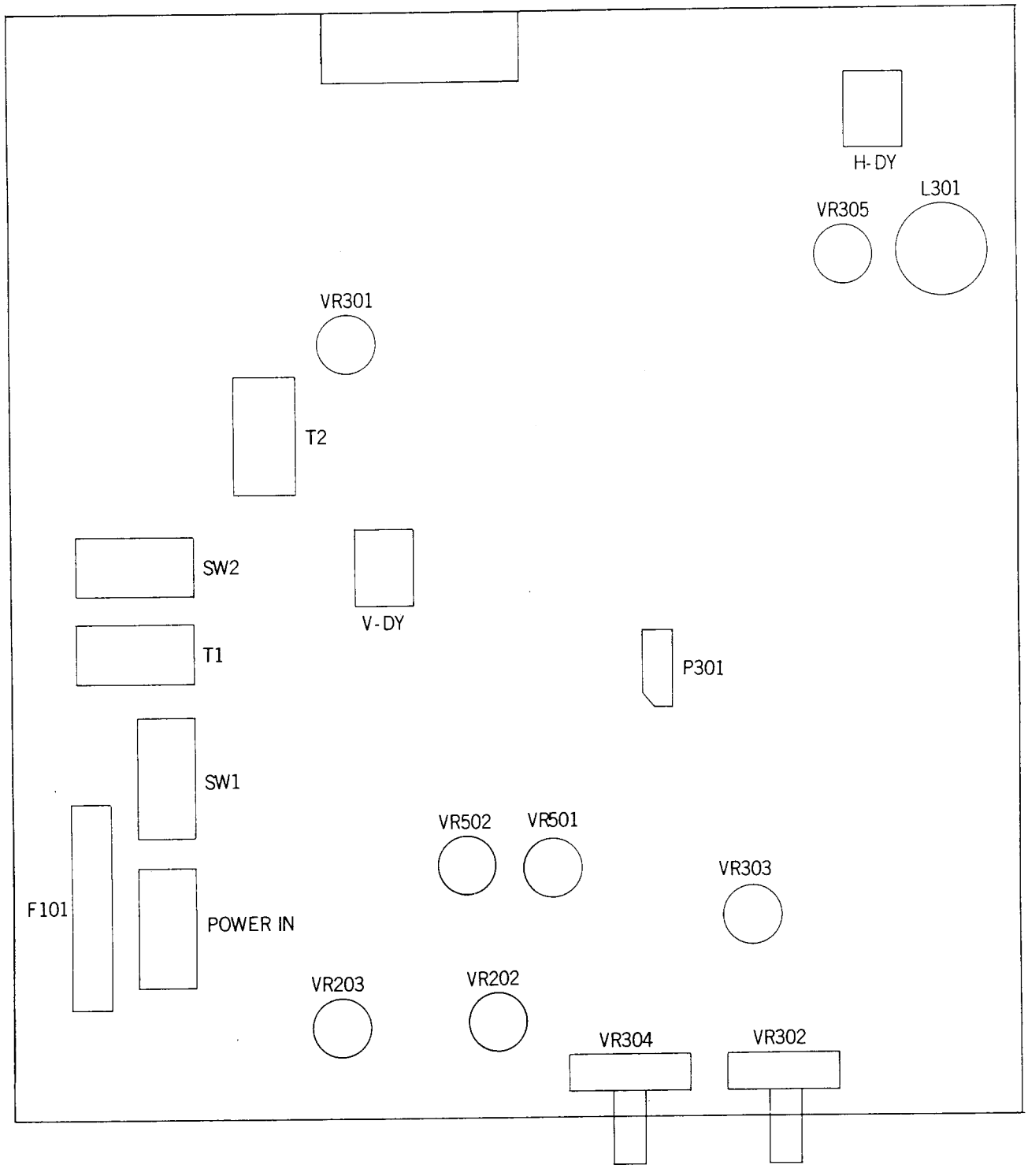
IC 501 (TDA 1180P)

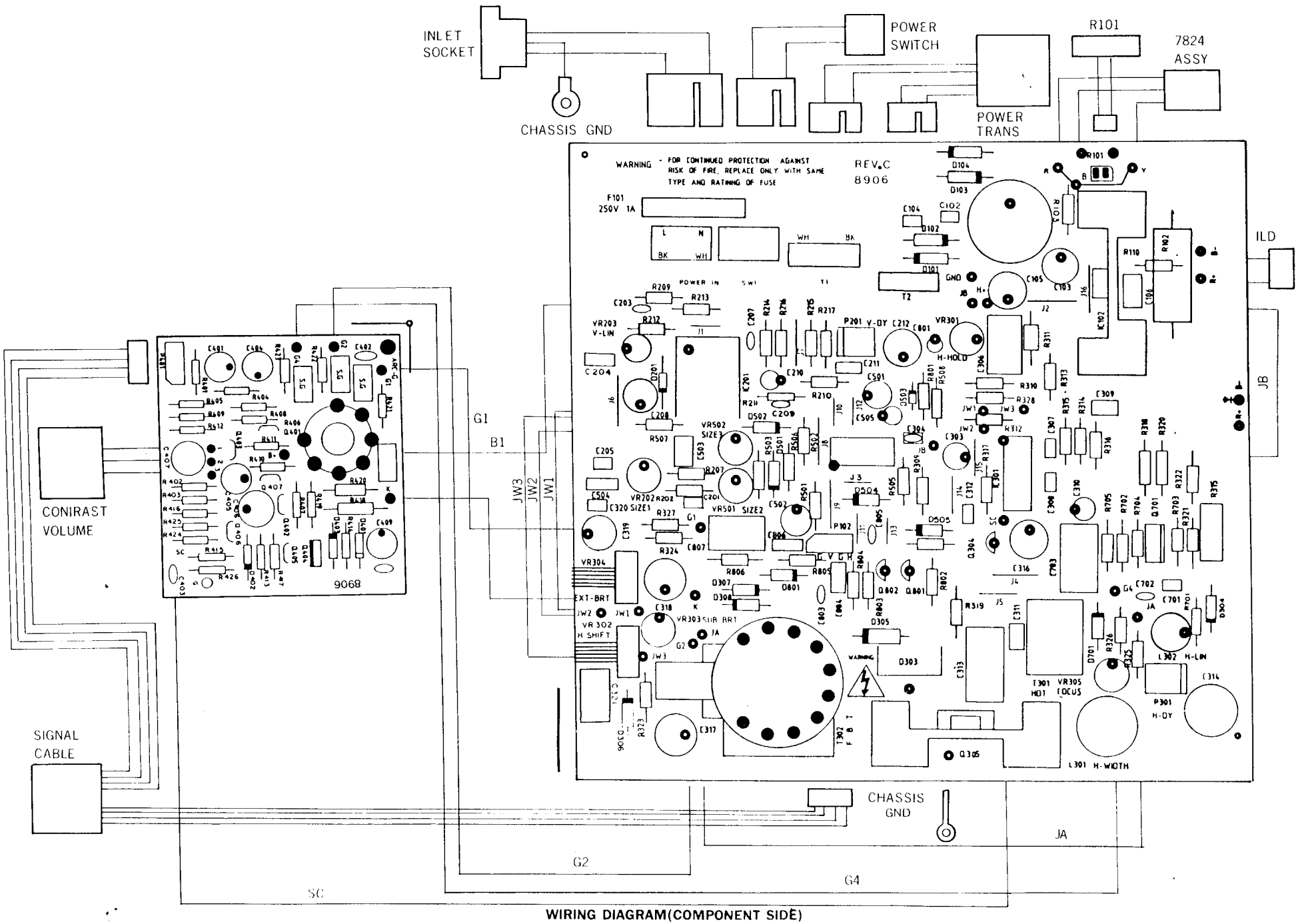
Non Signal	13.16	13.16	3.53	**NC**	9.24	0.47	1.18	0	**NC**	**NC**	0	**NC**	3.13	7.51	3.14	0
Signal Input	13.14	13.14	3.52	**NC**	9.24	0.48	1.18	-0.03	**NC**	**NC**	0	**NC**	3.08	7.50	3.14	0

* MEASUREMENT OF TEXT MODE (720×400)

(Unit:V)

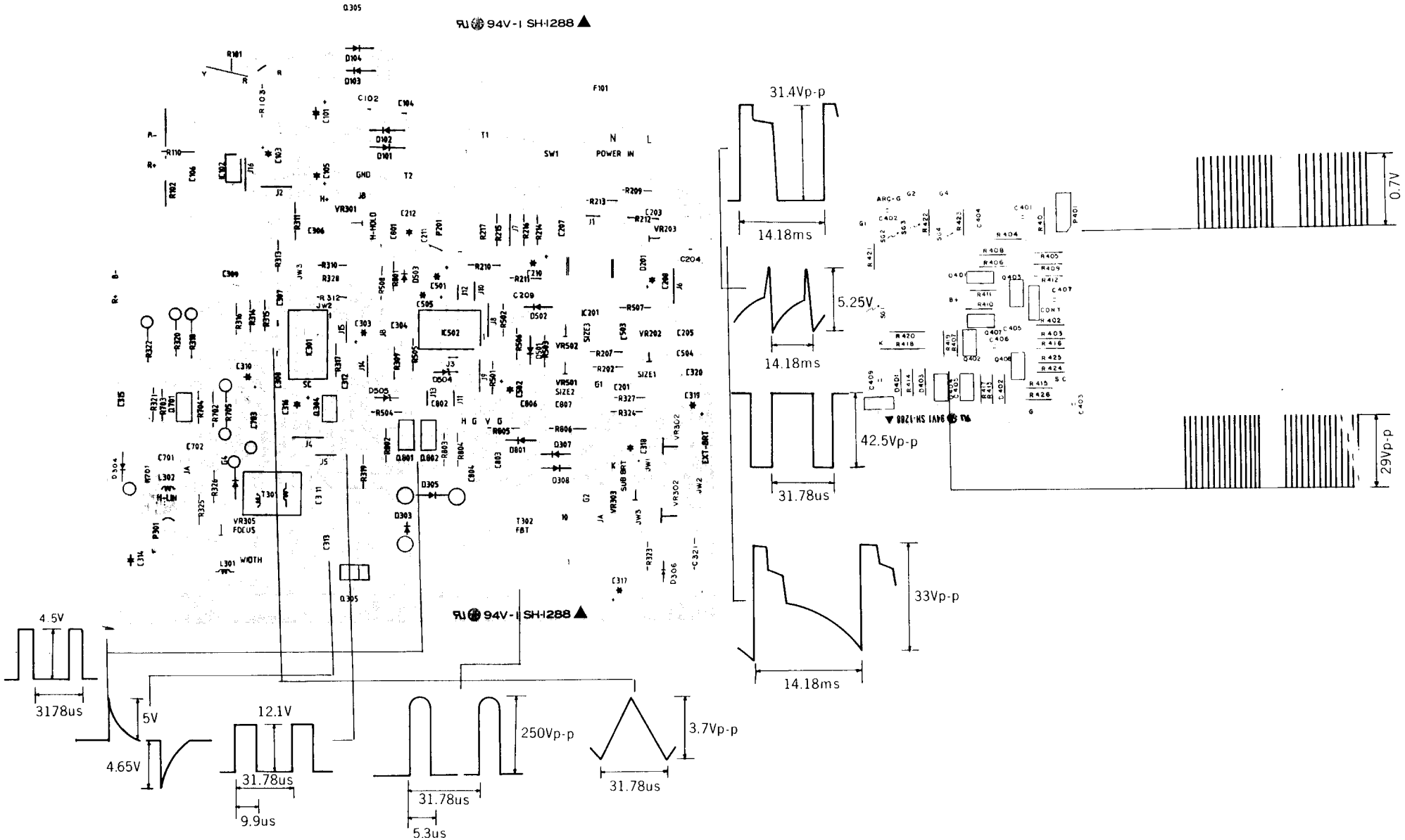
ADJUSTER AND CONNECTOR FOR MAIN PC BOARO



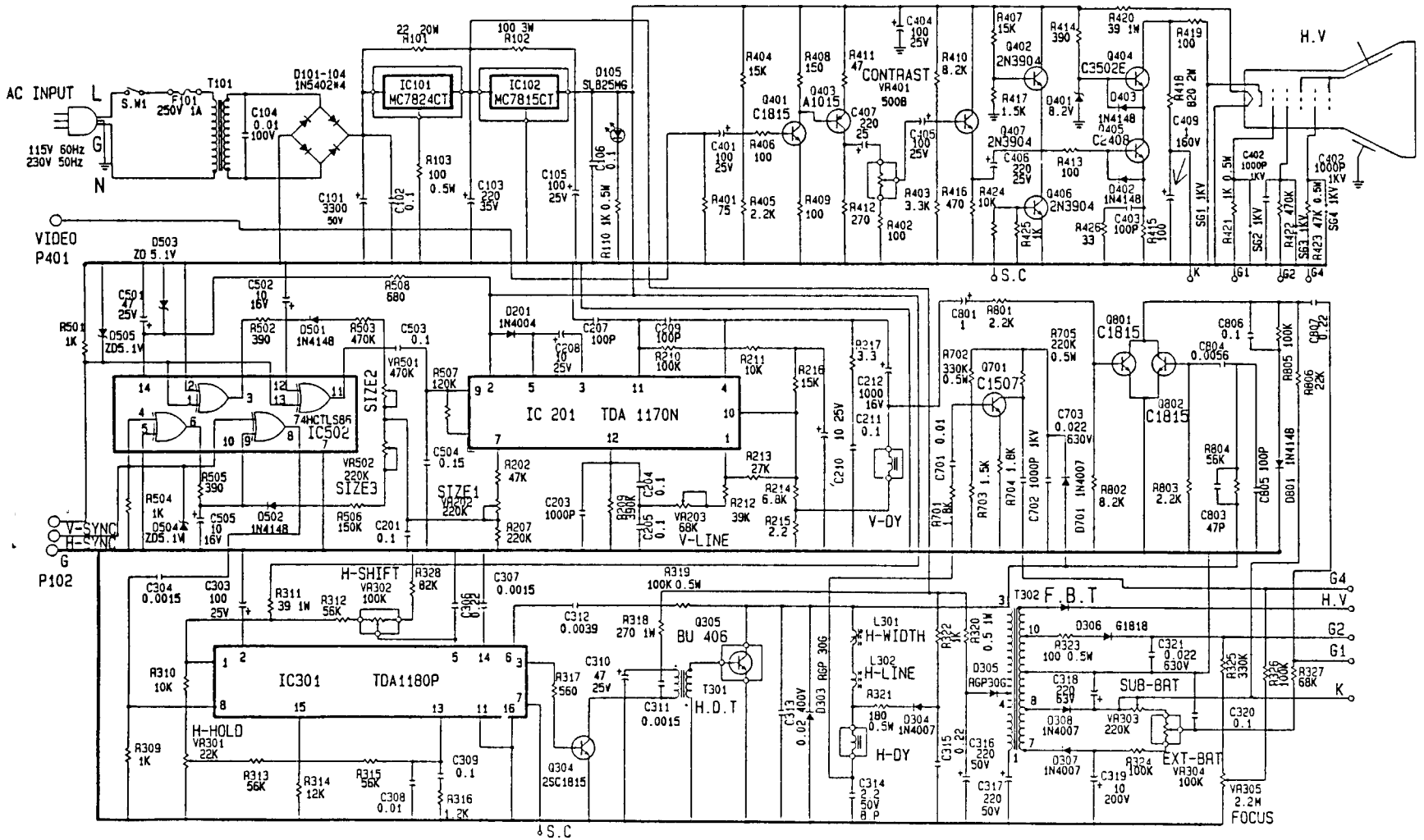


WIRING DIAGRAM(COMPONENT SIDE)

PC BOARD ASSEMBLY(SOLDER SIDE)



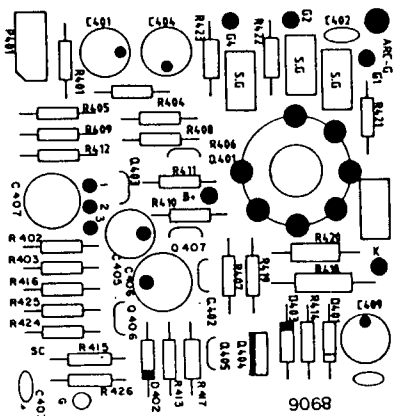
SCHEMATIC DIAGRAM



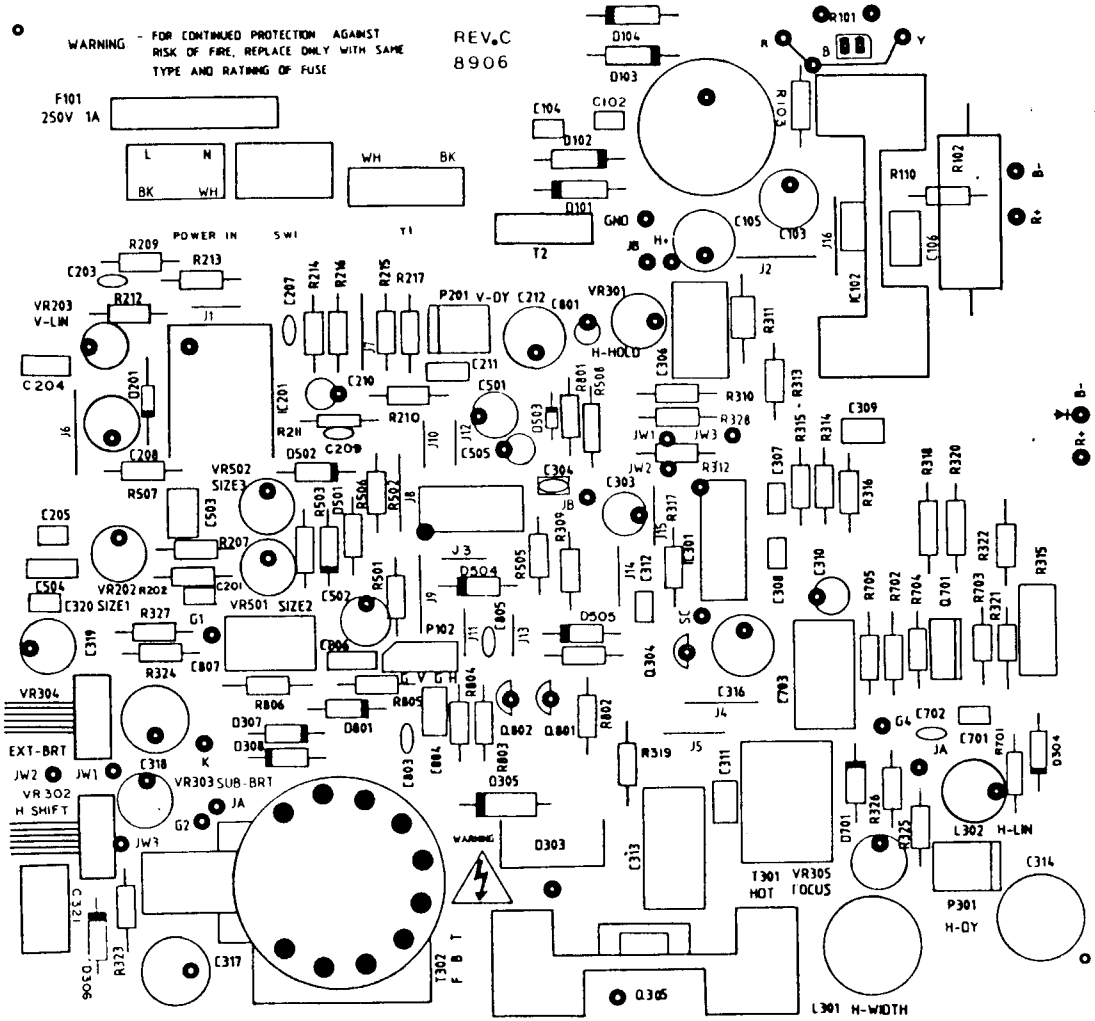
NOTE : UNLESS OTHERWISE SPECIFIED
1. ALL RESISTERS ARE IN OHM 0.25W
2. ALL CAPACITORS ARE IN uF 50V

PCB COMPONENT LOCATION

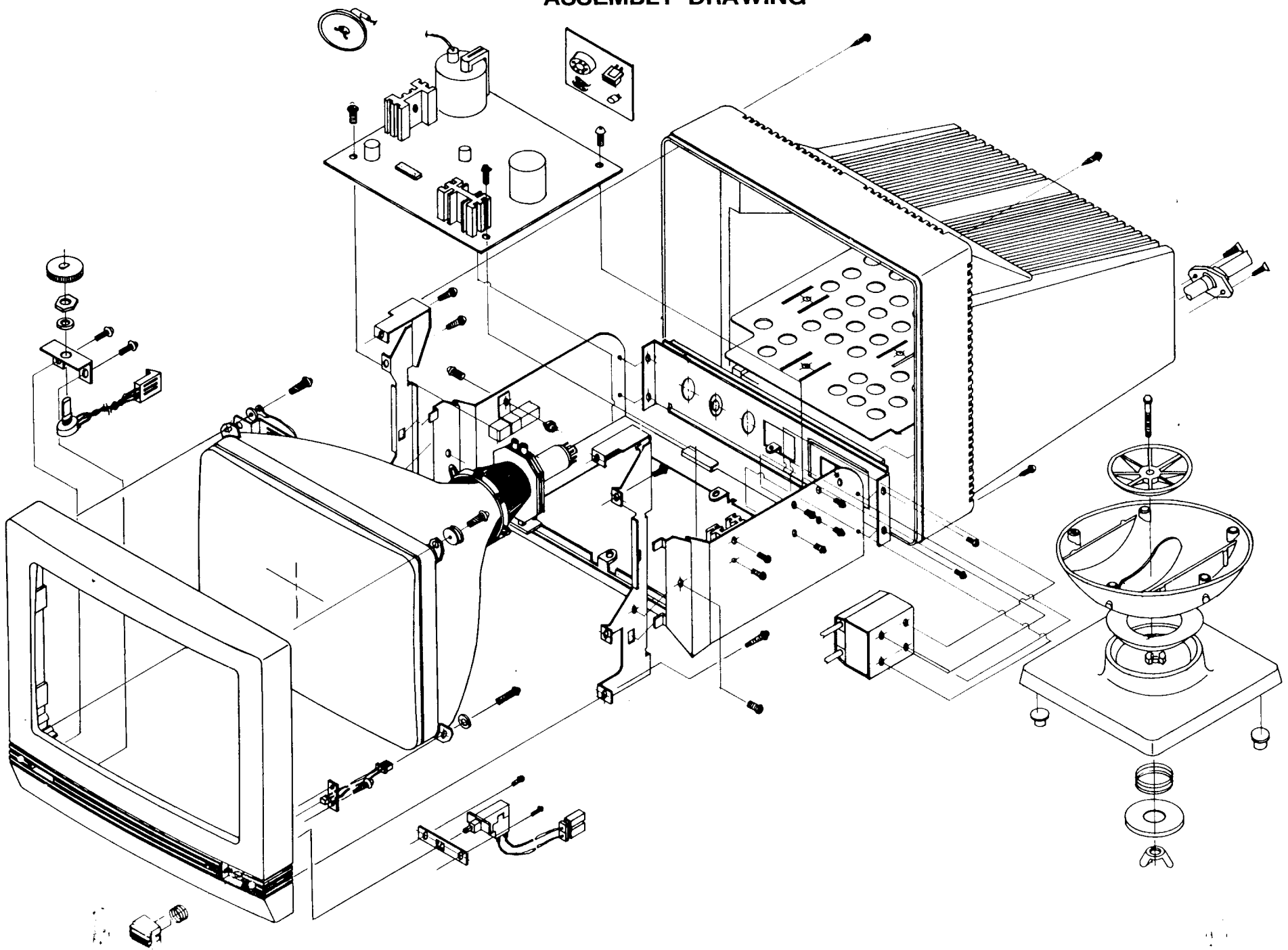
⟨SOCKET⟩



⟨MAIN⟩



ASSEMBLY DRAWING



REPLACENENT PARTS LIST

S/N	PART NO	DESCRIPTION	LOCATION NO	UNIT	Q'TY	REMARKS
1	22-04-101A	MAIN P.C BOARD FR-1		P	1	
2	00-06-092A	SUB ASS'Y HEAT SINK MC7824CT	IC101	A	1	
	24-01-003A	M-SCR PAN HEAD, WH, M3X8		P	1	
	24-01-003A	M-SCR PAN HEAD, WH, 7824CT			1	
	24-41-028A	IC, REGULATOR, TO-220 7824CT			1	
	10-07-027A	BUSHING T0-220			1	
	24-31-001A	HEX NUT M3			1	
	06-25-023A	HEAT SINK W60*H50*D14			1	
	23-03-001A	MICAR TO-220			1	
3	00-06-058A	ASS'Y 024 HEAT SINK MC7815CT	IC102	A	1	
	06-25-024A	HEAT SINK AL BL 50*40*18		P	1	
	20-03-011A	IC, REGULATOR, TO-220 7815CT			1	
	24-01-003A	M-SCR PAN HEAD M3*8W			1	
	24-31-001A	HEX NUT M3			1	
	24-41-001A	WASHER, FLAT(3.2×6.5×0.45)			1	
4	20-06-002A	IC, LINEAR, 12PIN TDA1170N	IC201		1	
5	20-06-006A	IC, LINEAR, DIP-16 TDA1180P	IC301		1	
6	20-17-086A	IC, TTL, HCT.DIP-14 74HCTLS86	IC502		1	
7	18-04-006A	TR, NPN C1815	TR304 801, 802	P	3	
8	00-06-079A	ASS'Y 024 HEAT SINK BU406	IC102	A	1	
	06-25-024A	HEAT SINK AL BL 50*40*18	TR305	P	1	
	18-07-006A	TR.NPN BU406			1	
	24-01-003A	M-SCR PAN HEAD M3 8W			1	
	24-31-001A	HEX NUT M3			1	
	24-41-001A	WASHER, FLAT(3.2×6.5×0.45)			1	
9	18-07-011A	TR, NPN, C1507	TR701	P	1	
10	19-01-007A	DIODE, RECTIFIER IN5402	D101-104	P	1	
11	19-01-008A	LED SLB25MG	D105	P	1	
12	19-01-004A	DIODE, RECTIFIER IN4004	D201	P	1	
13	00-06-060A	ASS'Y067 HEAT SINK RGP30G	D303	A	1	
	06-25-067A	HEAT SINK TIN PLATE 17*31*7		P	4	
	19-01-023A	DIODE, RECTIFIER RGP30G		P	1	
14	19-01-006A	DIODE, RECTIFIER 1N4007	D304, 307 308, 701	P	4	
15	19-01-023A	RGP30G	D305	P	1	
16	19-01-022A	C1818	D306	P	1	
17	19-03-004A	DIODE, SWITCHING 1N4148	D501, 502 801	P	3	
18	19-05-015A	DIODE, ZENER BZX5V1	D503, 504 505	P	3	
19	00-06-092A	ASS'Y RES. CEMENT	D503, 504 505	P	3	
	14-11-103A	RES, CEMENT, AB		P	1	
	21-05-191A	WIRE CONN HOUSING(RD.BK240 mm)				
20	14-11-101A	RES, METAL OXIDE.AB 100 3W	R102	P	1	

S/N	PART NO	DESCRIPTION	LOCATION NO	UNIT	Q' TY	REMARKS
21	14-11-101A	RES, CARBON, AT 100 /2W	R103, 323	P	1	
22	14-06-102A	RES, CARBON, AT 1K 1/2W	R110	P	1	
23	14-04-224A	RES, CAROBON, AT 220K 1/4W	R202	P	1	
24	14-04-224A	RES, CAROBON, AT 220K 1/4W	R207	P	1	
26	14-04-104A	RES, CARBON, AT 100K 1/4W	R210, 324 326, 805		4	
27	14-04-103A	RES, CARBON, AT 10K 1/4W	R211, 310	P	2	
28	14-04-393A	RES, CARBON, AT 39K 1/4W	R212	P	1	
29	14-04-273A	RES, CARBON, AT 27K 1/4W	R213	P	1	
30	14-04-682A	RES, CARBON, AT 6.8K 1/4W	R214	P	1	
31	14-04-022A	RES, CARBON, AT 2.2 1/4W	R215	P	1	
32	14-04-153A	RES, CARBON, AT 15K 1/4W	R216	P	1	
33	14-04-033A	RES, CARBON, AT 3.3 1/4W	R217	P	1	
34	14-04-102A	RES, CARBON, AT 1K 1/4W	R309, 322 501, 504	P	4	
35	14-09-390A	RES, METAOXIDE, AB 39 1W	R311	P	1	
36	14-04-563A	RES, CARBON, AT 56K 1/4W	R309, 322 315, 804	P	4	
37	14-04-123A	RES, CARBON, AT 12K 1/4W	R314	P	1	
38	14-04-122A	RES, CARBON, AT 1.2K 1/4W	R316	P	1	
39	14-04-561A	RES, CARBON, AT 560 1/4W	R317	P	1	
40	14-09-271A	RES, METALOXIDE, AB 270 1W	R318	P	1	
41	14-06-104A	RES, CARBON, AT 100K 1/2W	R319	P	1	
42	14-09-005A	RES, EMTALOXIDE, AB 0.5 1W	R320	P	1	
43	14-06-181A	RES, CARBON, AT 180 1/2W	R321	P	1	
44	14-04-334A	RES, CARBON, AT 330K 1/4W	R325	P	1	
45	14-04-683A	RES, CARBON, AT 68K 1/4W	R327	P	1	
46	14-04-823A	RES, CARBON, AT 82K 1/4W	R328	P	1	
47	14-04-391A	RES, CARBON, AT 390 1/4W	R502, 505	P	2	
48	14-04-474A	RES, CARBON, AT 470K 1/4W	R503	P	1	
49	14-04-154A	RES, CARBON, AT 150K 1/4W	R506	P	1	
50	14-04-124A	RES, CARBON, AT 120K 1/4W	R507	P	1	
51	14-04-681A	RES, CARBON, AT 680 1/4W	R508	P	1	
52	14-04-182A	RES, CARBON, AT 1.8K 1/4W	R701, 704	P	2	
53	14-06-334A	RES, CARBON, AT 330K 1/2W	R702	P	1	
54	14-04-152A	RES, CARBON, AT 1.5K 1/4W	R703	P	1	
55	14-06-224A	RES, CARBON, AT 220K 1/2W	R705	P	1	
56	14-04-222A	RES, CARBON, AT 2.2K 1/4W	R801, 803	P	1	
57	14-04-822A	RES, CARBON, AT 8.2K 1/4W	R802	P	1	
58	14-04-223A	RES, CARBON, AT 22K 1/4W	R806	P	1	
59	15-05-008A	VAR, V-TRIM 220KB 0.15W	VR202, 303, 502	P	3	
60	15-05-013A	VAR, V-TRIM 68KB 0.15W	VR203	P	1	
61	15-05-005A	VAR, V-TRIM 22KB 0.15W	VR301	P	1	
62	15-03-003A	VAR, H-TYPE HANDLE 100KB 0.2W	VR302 VR304	P	2	
63	15-05-010A	VAR, V-TRIM 2.2MB 0.15W	VR305	P	1	

S/N	PART NO	DESCRITION	LOCATION NO	UNIT	Q' TY	REMARKS
64	15-05-032A	VAR, V-TRIM 470K 0.15W	VR501	P	1	
65	16-01-107A	CAP, EL, RB, 85C 3300uF 50V	C101	P	1	
66	16-14-008A	CAP, MYLAR, RT 0.1uF 100V	C102, 106 201, 204 205, 211 309, 320 503, 806	P	1	
67	16-01-091A	CAP, ELE, RB 220uF 35V	C103	P	1	
68	16-14-020A	CAP, MYLAR, RT 0.01uF 100V	C104, 308 701	P	3	
69	16-04-007A	CAP, ELE, RB 100uF 25V	C105, 208	P	3	
70	16-11-005A	CAP, CERAMIC, RT 1000P 50V	C203	P	1	
71	16-11-005A	CAP, CERAMIC, RT 100P 50V	C207, 209 805	P	3	
72	16-04-004A	CAP, ELE, RT 10uF 25V	C210	P	1	
73	16-04-004A	CAP, ELE, RB, 1000uF 16V	C212	P	1	
74	16-14-025A	CAP, MYLAR, RT 0.0015u 100V	C304.307 311	P	3	
75	16-13-016A	CAP, MYLAR, RB 0.22uF100V	C306, 315 807	P	3	
76	16-04-006A	CAP, ELE, RT 47uF 25V	C310, 501	P	2	
77	16-13-010A	CAP, MYLAR, RT 0.0039u 100V	C312	P	1	
78	16-15-130A	CAP, P-P, RB 0.02u 400V	C313	P	1	
79	16-08-011A	CAP, BP, RB, 105 2.2uF50V	C314	P	1	
80	16-01-033A	CAP, ELE, RB 220uF 50V	C316, 317	P	2	
81	16-01-035A	CAP, ELE, RB 200uF 63V	C318	P	1	
82	16-01-073A	CAP, ELE, RB 10uF 200V	C319	P	1	
83	16-15-009A	CAP, P-P, RB 0.022u 630V	C321, 703	P	2	
84	16-04-023A	CAP, ELE, RT 10uF 16V	C502, 505	P	2	
85	16-13-015A	CAP, MYLAR, RB 0.15uF 100V	C504	P	1	
86	16-10-015A	CAP, CERAMIC, RB 1000V 1KV	C702	P	1	
87	16-04-001A	CAP, ELE, RT 1uF 50V	C801	P	1	
88	16-11-001A	CAP, CERAMIC, RT 47P 50V	C803	P	1	
89	16-14-006A	CAP, MYLAR, RT 0.0056u 100V	C804	P	1	
90	17-01-057A	TRANS, POWER 115/24V	T101	P	1	115V
91	17-01-064A	TRANS RP-CORE 230/24V	T101	P	1	230V
92	17-07-015A	TRANS, H-DRIVER 21mH 15%	T301	P	1	
93	17-02-034A	TRANS, FLYBACK FMC-1445BL	T302	P	1	
94	17-04-008A	COIL, WIDTH LITZ 18-50uH	L301	P	1	
95	17-05-025A	COIL, LIN 5μH	L302	P	1	
96	00-01-037A	ASS'Y DY	L303	A	1	
	17-03-022A	DY DMK-1493BL		P	1	
	21-05-165A	DY CONN, WH 150mm		P	1	
	21-05-166A	DY CONN, BK 90mm		P	1	
97	00-14-0534A	ASS'Y BACK PLATE		A	1	230V
	21-05-188A	INLET SOCKET CONNECTOR		P	1	
	10-07-004A	FASTNER 93mm		P	2	
	07-22-012A	CORE RING 29ϕ		P	2	
	24-26-011A	P-SCR COUNT SINK HEAD #4×12		P	2	

S/N	PART NO	DESCRIPTION	LOCATION NO	UNIT	Q' TY	REMARKS
	10-05-017A	STRAIN RELIEF 5P-4		P	1	
	10-05-020A	BACK PLATE 222×33.5×4		P	1	
	00-07-048A	ASS'Y SIGNAL CABLE 1400mm		P	1	
	10-08-002A	AC INPUT SOKCET 10A 250V 3P		P	1	
	21-06-063A	WIRE CONN. RING G/Y AWM1015 #8, 120MM 5 φ		P	1	
	12-21-003A	TUBE, SHRINK, WHTφ5, 20MM		P	3	
98	00-04-024A	ASS'Y POWER SWITCH	SW1	A	1	
	23-02-003A	POWER SWITCH		P	1	
	06-22-019A	S/W用 BRACKET		P	1	
	21-05-063A	WIRE CONN. HOUSING 2P		P	1	
99	00-14-0474	ASS'Y BACK PLATE		A	1	115V
	00-07-047A	ASS'Y SIGNAL CABLE		P	1	
	10-05-020A	BACK PLATE 222*33.5*4		P	1	
	10-05-017A	STRAIN RELIEF 5P-4		P	1	
	24-26-012A	P-SCR COUNT SINK HEAD		P	2	
	21-07-004A	P/SCORD SVT 3/18WG 115V BK 6FT		P	1	
	10-05-006A	CORD STOPPER BK		P	1	A-IIe
	10-05-243A	CORD PLATE(HIPS NORLY)		P	1	
	10-12-013A	CONN, HOUSING, 2P, GR		P	1	AMP 171157-1
	24-44-022A	TER.RING 5 ¢		P	1	
100	21-05-164A	ASS'Y S/W2 WIRE	S/W2	P	1	
101	21-05-033A	WIRE, CONN, HOUSING, 3P, 2.5N RD, BK, YL110MM	IC101	P	1	
102	10-11-074A	HDR, 4P	P102	P	1	
103	10-11-001A	HDR, LOCK, 3.96, 2P, BK	P201	P	1	
104	10-11-002A	HDR, LOCK, 3.96, 2P, WH	P301	P	1	
105	23-028A	FUSE 250V 1A	F101	P	1	
106	23-04-007A	FUSE CLIP 5*20mm		P	1	
107	10-11-019A	HDR, BEAD PIN ℄2.36		P	10	
108	21-02-080A	WIRE, MANUF, STRANDED AWM1007 #24 BL 125mm	JW1	P	1	
109	21-02-084A	WIRE, MANUF, STRANDED AWM1007 #24 RD 140mm	JW2	P	1	
110	21-02-084A	WIRE, MANUF, STRANDED AWM1007 #24, OR 140mm	JW3	P	1	
111	21-06-039A	WIRE, RING, TER INSUL 5℄ G/Y 65MM		P	1	
112	26-05-011A	CRT 14 INCH 14HBYWDN		P	1	
113	21-02-088A	WIRE, MANUF, STRANDED AWM1015#22 BL 165MM	JA	P	1	
114	21-02-013A	WIRE, MANUF, STRANDED AWM1007 #22 BK 50MM	JB	P	1	
115	21-02-086A	WIRE, MANUF, STRANDED AWM1007 #22 BK 170MM	LED-R	P	1	
116	21-02-087A	WIRE, MANUF, STRANDED AWM1004 #22 RD 170MM	LED-B	P	1	
117	21-06-052A	WIRE, BRAID RING TER 5 φ D BK 70MM	ARC-GND	P	1	

S/N	PART NO	DESCRIPTION	LOCATION NO	UNIT	Q'TY	REMARKS
118	20-04-101A	PC BOARD, SOCKET		P	1	
119	18-04-006A	TR, NPN C1815	TR401	P	1	
120	18-04-001A	TR, NPN 2N3904	TR402 406, 407	P	3	
121	18-05-002A	TR, PNP A1015	TR403	P	1	
122	18-19-003A	TR, NPN C3502E	TR404	P	1	
123	18-04-031A	TR, NPN C2408	TR405	P	1	
124	19-05-051A	DIODE, ZENER, 8.2EB	D401	P	1	
125	19-03-004A	DIODE, SWITCHING 1N4148	D402 403	P	2	
126	14-04-750A	RES.CARBON, AT 75 1/4W	R401	P	1	
127	14-04-101A	RES.CARBON , AT 100 1/4W	R402, 406 409, 413 415, 419	P	6	
128	14-04-032A	RES.CARBON, AT 3.3K 1/4W	R403	P	1	
129	14-04-153A	RES.CARBON, AT 15K 1/4W	R404 407	P	2	
130	14-04-222A	〃 2.2K 1/4W	R405	P	1	
131	14-04-151A	〃 150 1/4W	R408	P	1	
132	14-04-822A	〃 8.2K 1/4W	R410	P	1	
133	14-04-470A	〃 47 1/4W	R411	P	1	
134	14-04-271A	〃 270 1/4W	R412	P	1	
135	14-04-391A	〃 390 1/4W	R414	P	1	
136	14-04-471A	〃 470 1/4W	R416	P	1	
137	14-04-152A	〃 1.5K 1/4W	R417	P	1	
138	14-10-821A	RES.METAL OXIDE, AB 820 2W 5%	R418	P	1	
139	14-09-390A	RES.MERAL OXIDE, AB 39 1W 50%	R420	P	1	
140	14-06-103A	RES.CARBON, AT, 1K.1/2W	R421	P	1	
141	14-06-474A	〃 470K.1/2W	R422	P	1	
142	14-06-473A	〃 47K 1/2W	R423	P	1	
143	14-04-104A	〃 10K 1/4W	R424	P	1	
144	14-04-103A	〃 1K 1/4W	R425	P	1	
146	16-04-007A	CAP.ELECT, RT 85℃ 100uF 25V	C401 404, 405	P	2	
147	16-10-079A	CAP.CERAMIC, RB 1000pF 100V 10%	C402	P	1	
148	16-10-002A	CAP.CERAMIC, RB 100P 50V 10%	C403	P	1	
149	16-01-021A	CAR.ELECT, RB, 85℃ 220uF 25V	C406, 407	P	2	
150	16-02-020A	CAP.ELECT, RB, 105℃ 1uF 160V	C409	P	1	
151	16-24-003A	SPARK CAP 1KV -15% +50%	SG401 402 403 404	P	4	
152	10-11-014A	HDR, 4P BW-604J	P401	P	1	
153	10-08-017A	SOCKET, IC, CRT	P402	P	1	
154	00-05-024A 15-04-011A 21-02-122A	ASS'Y CONT, VOLUME ASS'Y H-TYPE, 500 B 0.5W WIRE, MANUF, STRANDED AWM1007 #22, RD 530MM	VR401	P P P	1 1 1	

S/N	PART NO	DESCRIPTION	LOCATION NO	UNIT	Q' TY	REMARKS
	21-02-121A	WIRE, MANUF, STRANDED AWM1007 #22, GR 530MM		P	1	
	21-02-120A	WIRE, MANUF, STRANDED AWM1007 #22, YL 530MM		P	1	
	07-22-012A	CORE, RING 29¢		P	1	
	10-07-004A	FASTNER 93MM		P	3	
	06-22-021A	CONT BRKT		P	1	
	12-21-002A	TUBE SHRINK WHT 4×20		P	1	
155	21-02-123A	WIRE, MANUF, STRANDED AWM1007#22 BR 215MM	G1	P	1	
156	21-20-126A	WIRE, MANUF, STRANDED AWM1015#22 BL 255MM	G2	P	1	
157	21-02-127A	WIRE, MANUF, STRANDED AWM1015#22 VI 280MM	G4	P	1	
158	21-02-106A	WIRE, MANUF, STRANDED AWM1007#22 YR 180MM	K	P	1	
159	21-02-125A	WIRE, MANUF, STRANDED AWM1007#22 RD 180MM	H+	P	1	
160	21-02-124A	WIRE, MANUF, STRANDED AWM1007#22 BK 200MM	SC	P	1	
161	10-05-084A	FRONT BEZEL 319×286.5×35		P	1	
162	10-05-098A	REAR HOUSING 319×286.5×284		P	1	
163	10-05-186A	POWER SWITCH CAP 19.6×13.6×17		P	1	
164	10-05-187A	KNOB FOR BRIGHTNESS ¢ : 32×10		P	1	
165	10-05-052A	STAND W : 45, ¢ 260		P	1	
166	10-05-049A	PARTS OF STAND ϕ : 115×14.7		P	1	
167	10-05-054A	NECK ϕ : 118×40.6		P	1	
168	10-05-048A	PARTS OF NECK ϕ : 90×16.45		P	1	
169	06-20-061A	CHASSIS MAIN 226×209.7×93		P	1	
170	06-21-043A	PLATE SUPPORT, LH38×88.8×268		P	1	
171	06-21-044A	PLATE SUPPORT, RH38×88.8×268		P	1	
172	06-20-062A	CHASSIS, BACK 51×228×1.0		P	1	
173	06-20-034A	CHASSIS, BOTTOM SHIELD PLATE		P	1	
174	06-25-011A	TDA1170N HEAT SINK 18×21×25		P	1	
175	06-23-003A	GND LUG 18.1×66×0.35		P	1	
176	06-21-033A	GND CLIP SIGNAL		P	1	
177	13-11-104A	CARTON BOX 390×410×410		P	1	
178	13-16-105A	USER'S MANUAL		P	1	
179	06-25-061A	LOGO SAMTRON 13×46×1.3		P	1	
180	13-15-348A	PRODUCT LABEL 50×0.3×100		P	1	
181	13-13-029A	STYROFOAM LH		P	1	
182	13-13-030A	STYROFOAM RH		P	1	
183	13-17-003A	VINYL BAG		P	1	
184	13-17-005A	VINYL BAG CORD 100×400×0.1		P	2	
185	24-04-014A	P-SCR PAN HEAD #7×15WH	F/B+P/S CRT ASS'Y	P	10	
186	24-04-004A	P-SCR PAN HEAD #6×8WH	S/W ASS'Y CONT ASS'Y	P	5	

S/N	PART NO	DESCRIPTION	LOCATION NO	UNIT	Q' TY	REMARKS
187	24-05-007A	T-SCR PAN HEAD M3×5WH	CASSIS + 7824 ASS'Y	P	1	
188	24-31-001A	NUT, HEX M3×0.5WH	RES.ASS'Y	P	1	
189	24-26-027A	M-SCR PAN HEAD CLIP TYPE M4×13.5WH	P/H+P/S	P	4	
190	24-26-038A	M-SCR PAN HEAD CLIP TYPE W/WASHER	TRANS-FORMER AC GND	P	6	
191	24-31-005A	NUT, HEX M4×0.7WH	AC GND	P	2	
192	24-26-037A	M-SCR PAN HEAD CLIP TYPE W/WASHER M3×8WH	PCB BACK + NAIN RES ASS'Y	P	9	
193	24-26-003A	M-SCR TRUSS HEAD M4×6WH	MAIN+P/S	P	2	
194	24-41-013A	WASHER PLAT 5.3×16.12WH	CRT ASS'Y	P	4	
195	24-03-006A	M-SCR HEX HEAD M5×40WH	STAND ASS'Y	P	1	
196	24-33-002A	BUTTERFLY NUT M5×0.9WH	STAND ASS'Y	P	1	
197	24-01-008A	M-SCR PAN HEAD 4×10	NECK ASS'Y	P	3	
198	24-26-001A	M-SCR C/SINKING HEAD M3×8WH	BACK CHASS -IS+B/P	P	4	
199	24-02-005A	M-SCR PAN HEAD W/WASHER CLIP TYPE M4×10	GND	P	1	
200	24-42-005A	WASHER GEAR, OUT SIDE M4WH	GND AC GND	P	2	
201	24-45-008A	COMPRESSION SPRING 0.6×7×17 YL	S/W ASS'Y	P	1	
202	24-45-002A	COMPRESSION SPRING 23×17×2 YL	STAND ASS'Y	P	1	
203	10-09-007A	RUBBER WASHER 14×5×2	CRT ASS'Y	P	3	
204	24-26-017A	T-SCR PAN HEAD W/WASHER UA/8×5/16WH	PCB + HEAT SINK, GND CLIP	P	4	
205	13-17-072A	FOIL SHEET 291×70, 0.3T		P	1	230V ONLY
206	12-20-020A	AL TAPE		P	1	〃